

4 100L4 3,

=26,7 .

J =0,1 .².

1 -

4 100L4 3

		4
, U ₁		380
, f _c		50
, n	/	1500
, s	%	4,6
, s	%	31,5
/	-	2,0
/	-	1,6
/	-	2,4
I /I	-	6,0
, J	. ²	0,011
, η	%	87
, cosφ	-	0,83

2 -

	μ							
		R ₁ '	X ₁ '	R ₂ ''	X ₂ ''	R'' ₂	R	
.	2,4	0,067	0,079	0,053	0,14	0,058	0,13	0,15

:

$$I_{1.} = \frac{2}{3 \cdot U_1 \cdot \eta \cdot \cos \varphi} = \frac{4 \cdot 10^3}{3 \cdot 220 \cdot 0,82 \cdot 0,83} = 8,9 \text{ .}$$

:

$$= \frac{U_1}{I_{1.}} = \frac{220}{8,9} = 24,7 \text{ .}$$

$$r = R \cdot \frac{U_1}{I_{1.}} = R \cdot \frac{220}{8,9} = 24,7 \cdot R$$

x, r – ,

X, R – , . . .

3.

3 –

	μ							
		R_1'	X_1'	R_2''	X_2''	R''_2	R	
	59,28	1,64	1,95	1,31	3,46	1,43	3,21	3,71

.

, . . .

$U > U_1$, $I > I_1$.

4-5,5.

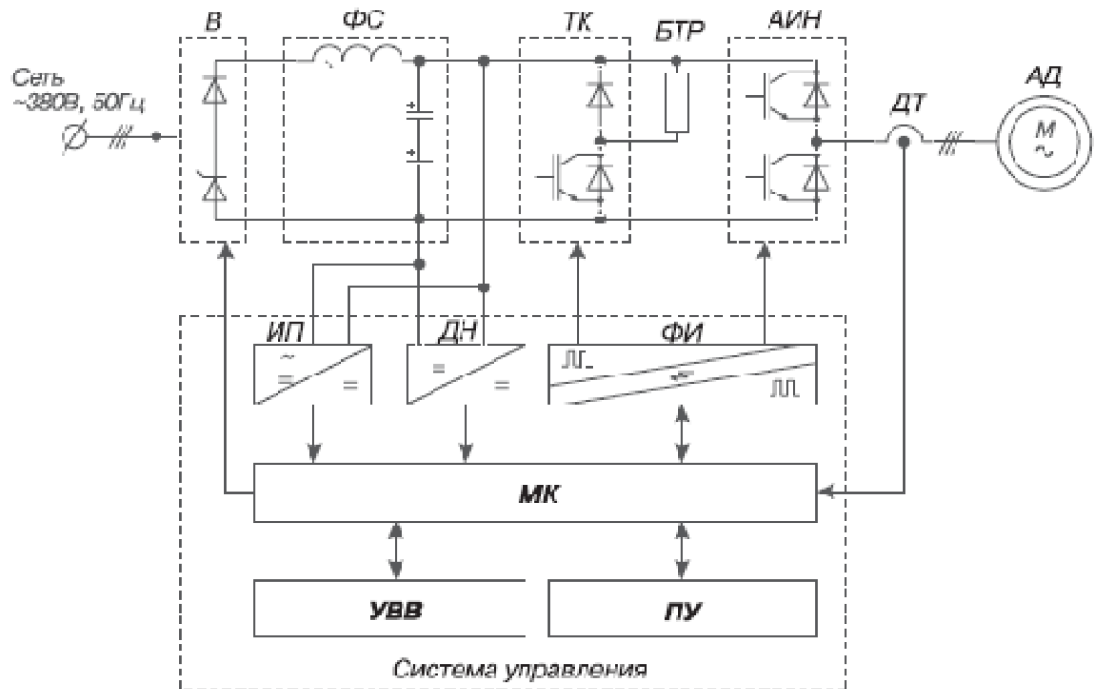
.

4.

4 –

4 – 5,5

U_c	,	380
	, f	$50 \pm 2\%$
	, m	3
	, U_1	$0 \pm 380, \pm 2\%$
	, I_1	11
	, f_1	$0 \pm 400, \pm 0,05\%$
	, I	%
	, t	60



–	–	;
	–	() ;

<p>LC-</p> <p>(IGBT)</p> <p>(IGBT)</p>	<p>()</p> <p>/ (</p>
--	-----------------------

1 -

05

4-5,5

- -

F U

()

(IGBT),

, . .

.

$$L_2 \geq \frac{0,25 \cdot}{(0,4 \dots 0,6) \cdot f \cdot I_1},$$

10%.

$$= 1,1 \cdot U_d = 1,1 \cdot 515 = 566,5$$

f -

$$f = 8$$

10

$$L_2 \geq \frac{0,25 \cdot 515}{0,6 \cdot 8000 \cdot 8,9} = 0,003 \text{ .}$$

– 20,5-2,02 3,

5.

5 –
– 20,5-2,02 3

	, U	410
	, I ₁	20,5
L	,	2,02
R _p	,	265

:

$$C_2 = \frac{2}{64 \cdot k \cdot L_2},$$

– , ;

$$= \frac{1}{f} = \frac{1}{8000} = 0,000125 \text{ .}$$

k – ; k = 0,05;

:

$$C_2 = \frac{0,000125^2}{64 \cdot 0,05 \cdot 2,02 \cdot 10^{-3}} = 2,47 \text{ .}$$

–1-400 –

2,4 ±10%.

$$S_{LC} = \frac{q}{q},$$

$$q - ;$$

$$q - 0,01 \dots 0,1; \quad q = 0,01.$$

:

$$q = \frac{2}{n^2 - 1} \sqrt{1 + n^2 \cdot \operatorname{tg}^2 \alpha},$$

$$n - ;$$

$$n = 6;$$

$$\alpha - ; \quad \alpha = 0^\circ,$$

$$q = \frac{2}{6^2 - 1} \sqrt{1 + 6^2 \cdot \operatorname{tg}^2 0^\circ} = 0,057.$$

:

$$S_{LC} = \frac{0,057}{0,01} = 5,7$$

$$100 \quad 1$$

$$: C_1 = 100 \cdot$$

$$= 100 \cdot 4 = 400$$

390 ±10%.

:

$$L_1 = \frac{S_{LC} + 1}{n^2 \cdot \omega^2 \cdot C_1},$$

$$\omega = 2 \cdot \pi \cdot f_c = 2 \cdot 3,14 \cdot 50 = 314 \quad / -$$

$$L_1 = \frac{5,7 + 1}{6^2 \cdot 314^2 \cdot 390 \cdot 10^{-6}} = 4,84 \cdot 10^{-3} .$$

-250/0,5 3 ,

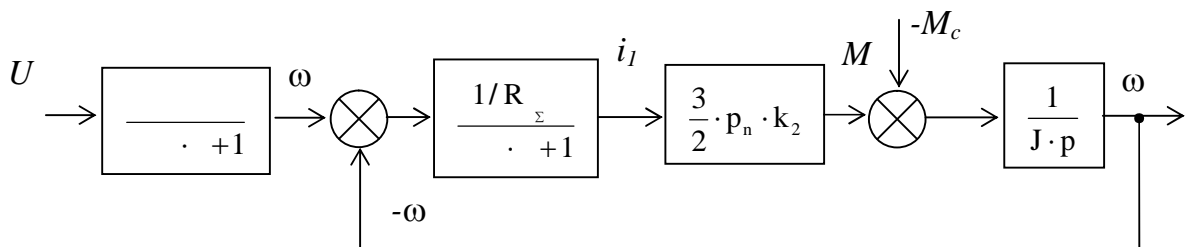
6.

6 -

- 250/0,5 3

	, I ₁	320
L	,	4,2
R _p	,	11,5

2.



:

$$W(p) = \frac{U_d}{U \cdot +1},$$

-

$$= \frac{U_d}{U} ,$$

$$U_d - , ;$$

$$U -$$

:

$$= \frac{220}{10} = 22.$$

-

,

$$(=1).$$

:

$$T = \frac{1}{f} = \frac{1}{8000} = 0,000125 \approx 0,0001 .$$

:

$$= + = 0,001 + 0,0001 = 0,0011 .$$

,

,

.

:

$$W(p) = \frac{1/R_{\Sigma}}{\dots + 1},$$

$R_{\Sigma} -$

:

$$R_{\Sigma} = R_2 + R_1 + k_2^2 \cdot R_2',$$

$R_2 -$

, ;

$R_1 -$

, ;

$R_2' -$

,

;

$k_2 -$

.

:

$$L_{\mu} = \frac{x_{\mu}}{2 \cdot \pi \cdot f_1} = \frac{59,28}{2 \cdot 3,14 \cdot 50} = 0,188$$

:

$$L_{1\sigma} = \frac{x_1}{2 \cdot \pi \cdot f_1} = \frac{1,95}{2 \cdot 3,14 \cdot 50} = 0,0062$$

.

:

$$L_1 = L_{\mu} + L_{1\sigma} = 0,188 + 0,0062 = 0,1942$$

:

$$L_{2\sigma}' = \frac{x_2'}{2 \cdot \pi \cdot f_1} = \frac{3,46}{2 \cdot 3,14 \cdot 50} = 0,011$$

.

:

$$L_2 = L_{\mu} + L_{2\sigma}' = 0,188 + 0,0011 = 0,1891$$

:

$$L_{\Sigma} = L_2' - \frac{L_{\mu}^2}{L_1} = 0,1891 - \frac{0,188^2}{0,1942} = 0,0071$$

$$L_{\Sigma} \approx L_{1\sigma} + L_{2\sigma}' \approx 0,0062 + 0,011 \approx$$

0,0073 .

$$L_{\Sigma} = 0,0071$$

:

$$k_2 = \frac{L_{\mu}}{L_2} = \frac{0,188}{0,1891} = 0,994.$$

:

$$R_{\Sigma} = 0,265 + 1,64 + 0,994^2 \cdot 1,31 = 3,199 \quad .$$

:

$$= \frac{L_{\Sigma}}{R_{\Sigma}} = \frac{0,0071}{3,2} = 0,002 \quad .$$

:

$$M(p) = \frac{3}{2} \cdot p_n \cdot k_2 \cdot i_1(p) = \frac{3}{2} \cdot 2 \cdot 0,994 \cdot i_1(p) = 2,982 \cdot i_1(p),$$

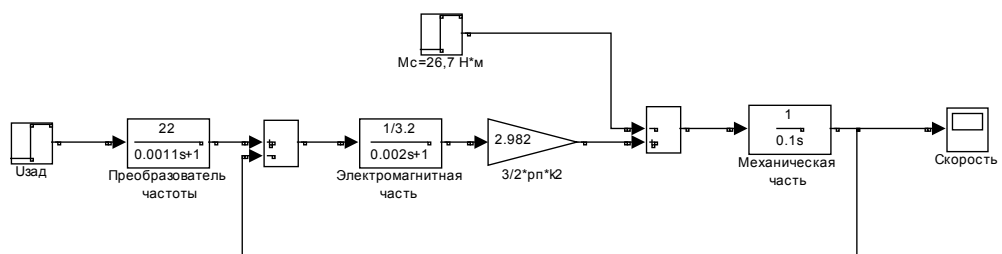
$$- \quad , \quad = 2.$$

:

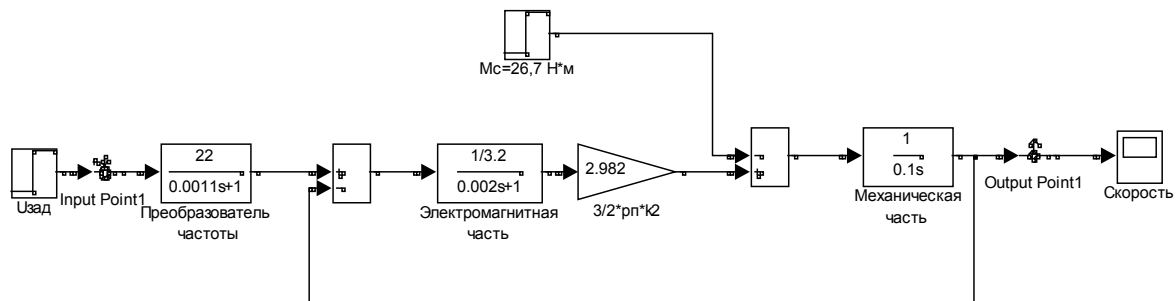
$$W(p) = \frac{1}{J \cdot p} = \frac{1}{0,1}.$$

Simulink.

3.



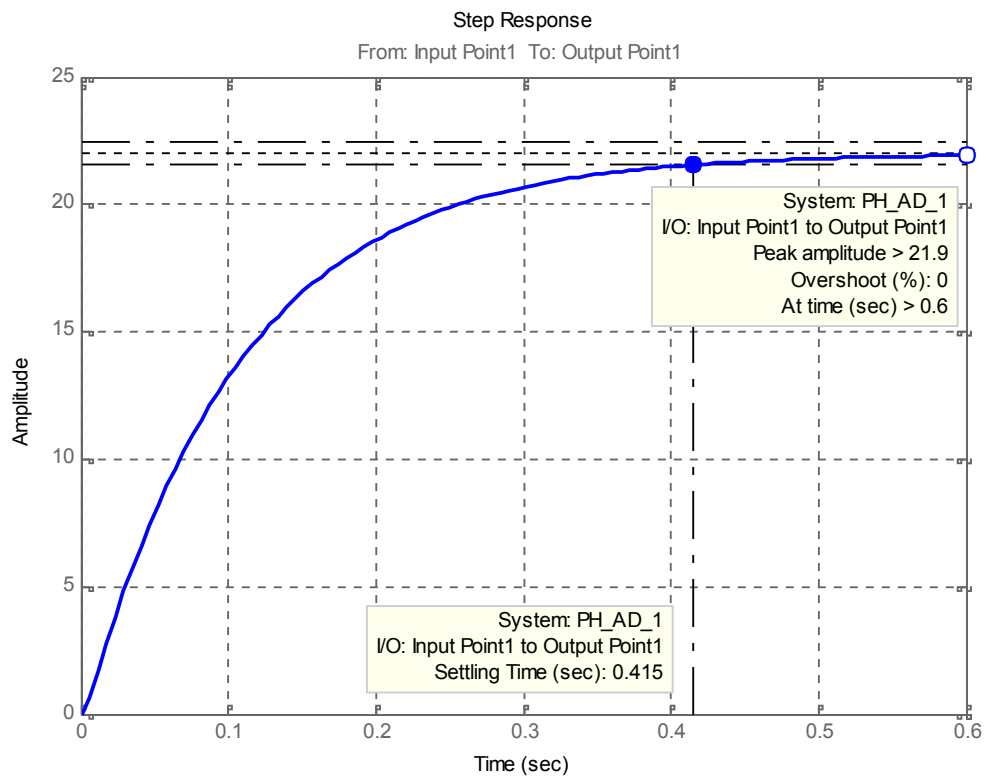
3 -



4 -

$$= 26,7$$

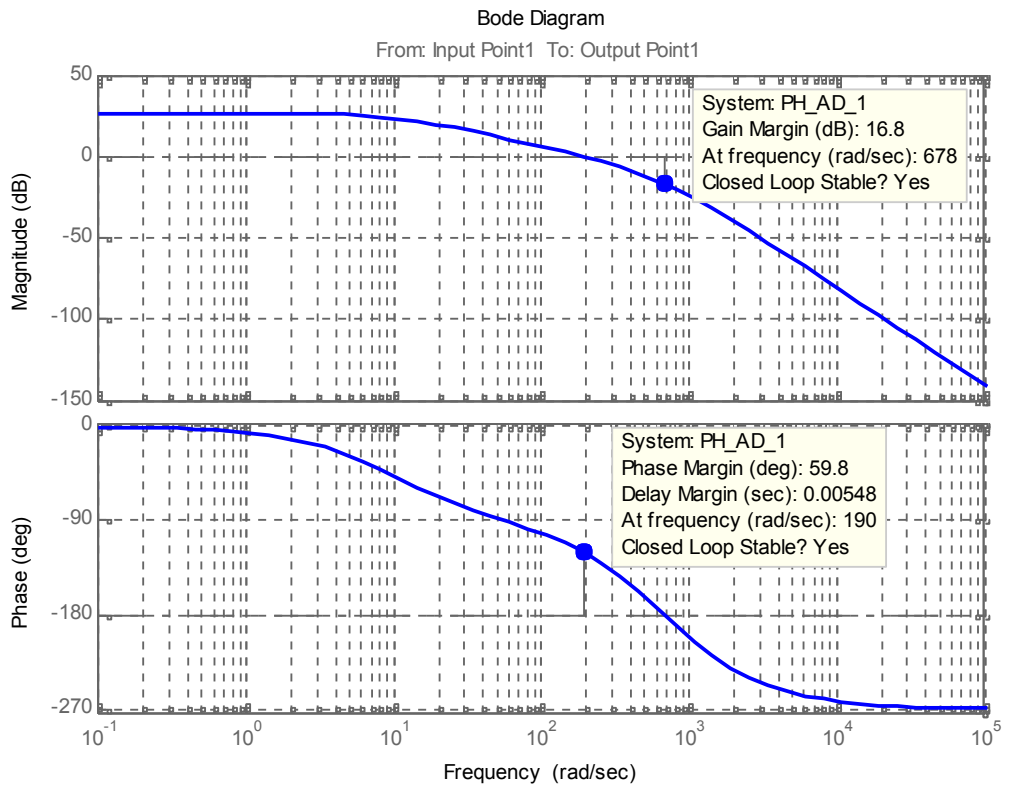
$$= \frac{4000}{\omega \cdot (1 - s)} = \frac{1500}{9,55} \cdot (1 - 0,046) = 26,69$$



5 -

$$K = 21,9.$$

$$t_s = 0,415$$



6 -

,
,
:
-

$\omega = 190$ / ;

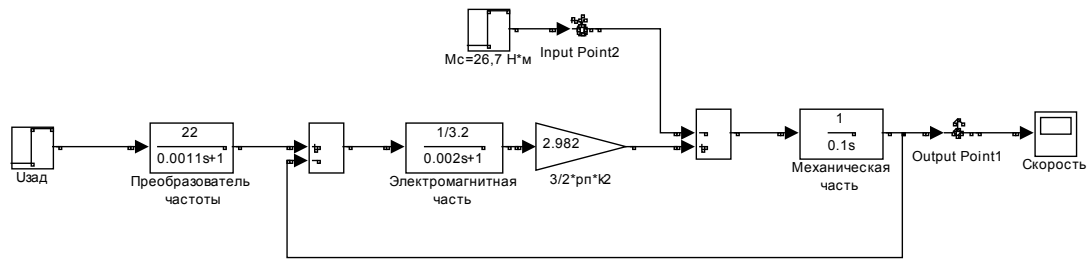
- $59,8^\circ$

16,8 .

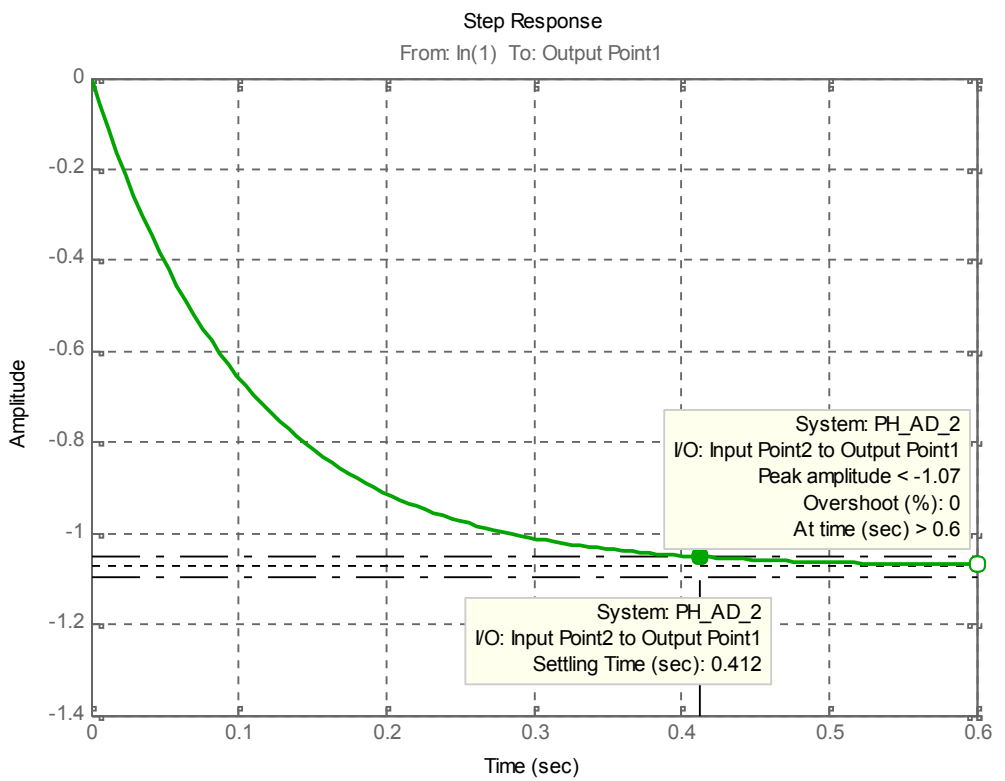
-
-
, 7. ,

4
Input Point Output Point.

8 9.



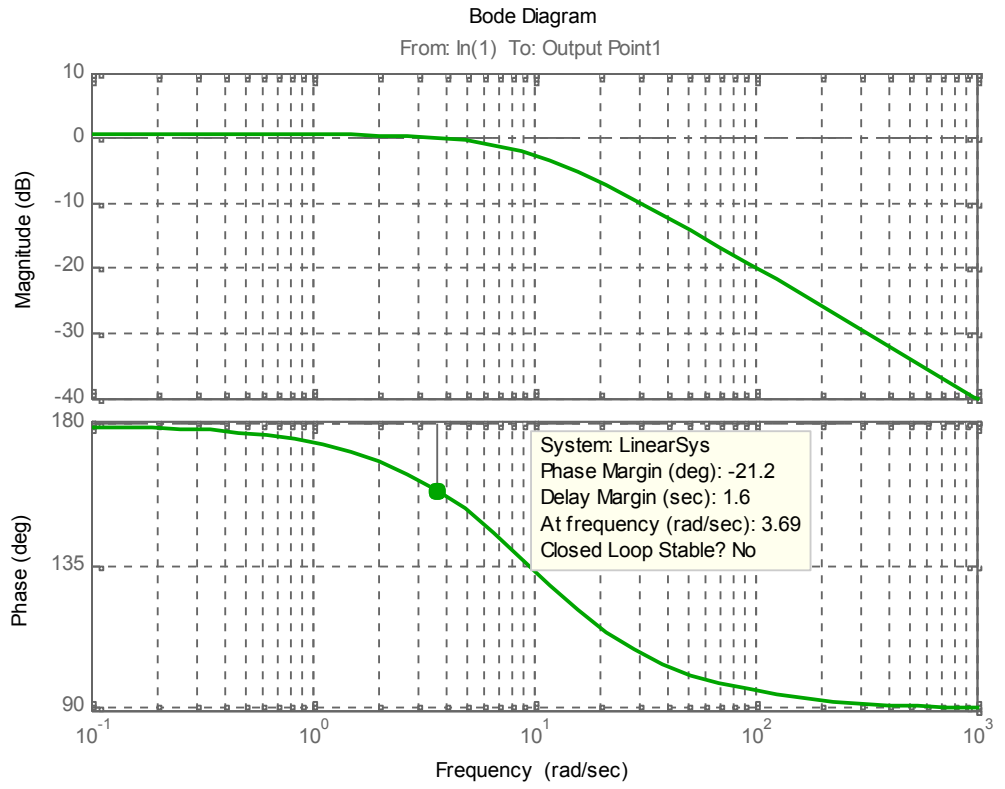
7 -

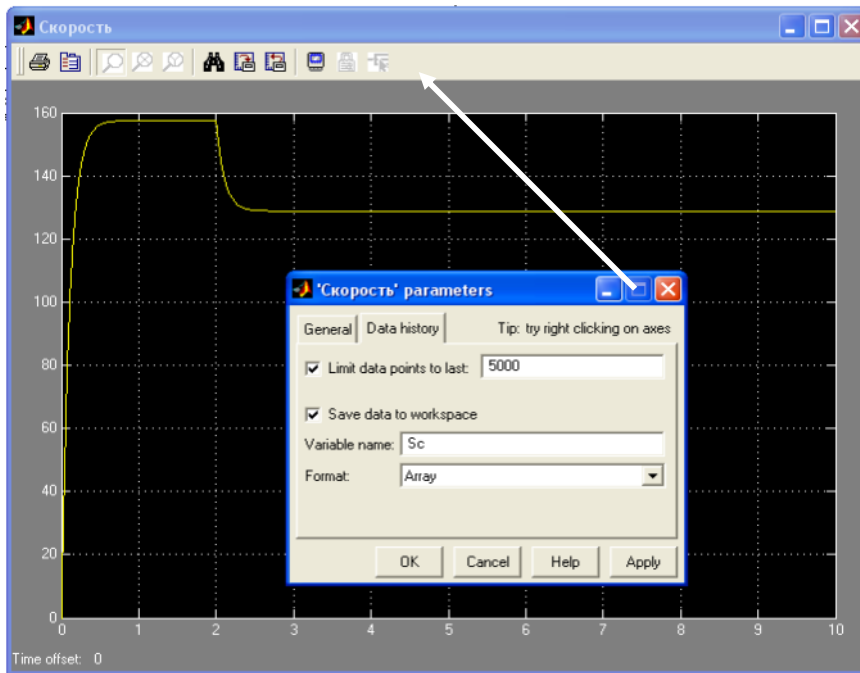


8 -

(
 $t_{\text{settling}} = 0,412$)
 $(t_{\text{settling}} = 0,415)$

$$= \frac{1}{J} = \frac{1}{0,1} = 10$$





10

(Scope).

,

(«

» parameters):

Save data to workspace;

(

Sc)

(Array).

,

-

.

%

x = Sc (:, 1)

%

y = Sc (:, 2)

%

plot (x, y)